

STATUSES OF COMPLIANCE CONDITIONS STIPULATED BY MOEF IN ENVIRONMENTAL CLEARANCE VIDE LTR NO. J-11015/183/2007-IA-II(M) dt.13-05-09 ACCORDED TO KALARANGIATTA CHROMITE MINES OF M/s. FERRO ALLOYS CORPORATION LIMITED.

PERIOD : OCTOBER,2015 TO MARCH, 2016

A) SPECIFIC CONDITIONS :

- i) All the conditions stipulated by the State Pollution control Board, Odisha in their consent to establish shall be effectively implemented.
 - All stipulated conditions are being effectively implemented
- ii) The environmental clearance is granted for opencast mining only. For the underground mining, the project proponent shall obtain separate clearance after getting the mine plan approval from the Indian Bureau of Mines.
 - Now opencast mining operation is going on. Before starting underground mining the project proponent will obtain separate clearance after getting mining plan approval from the Indian Bureau of Mines.
- iii) The environmental clearance is subject to approval of the State Land purposes Dept. Govt. of Odisha for diversion of agricultural land for non-agricultural use.
 - Till date Agricultural land has not been used for non-agricultural use. Diversion of Agricultural land for non-agricultural use will be done after getting approval from the State Land use Dept., Govt. of Odisha.
- iv) The Project proponent shall ensure that no natural watercourse and/or water resources are obstructed due to any mining operations. Adequate measures shall be taken for protection of Damsala Nallah and other seasonal channels, if any emanating from the mine lease, during the course of mining operation.
 - There is no natural water course or water resource obstructed due to the mining operation. Adequate measures have been taken before discharging the mines pumped out water to Damsala nallah.
- v) The top soil shall temporarily be stored at earmarked site(s) only and it should not be kept unutilized for long. The top soil shall be used for land reclamation and plantation.
 - 744 M³ top soil has been generated and out of this 340 M³ of top soil used for plantation purpose & 404 M³ top soil stored at the earmarked site. Top soil will be used for land reclamation and plantation purposes.

vi) The overburden (OB) generated during the mining operation shall be stacked at earmarked dump site (s) only and it should not be kept active for a long period of time and their phase-wise stabilisation shall be carried out. There shall be one external over burden dump having maximum projected height of 30m. Proper terracing of the OB dump maintained to 27°. The OB dump shall be scientifically vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles shall be undertaken for stabilisation of the dump. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis.

➤ The OB generated during the mining operation is being stacked at earmarked dump site. The OB dump is not kept active for long period. Overall slope of the OB dump is being maintained below 29° 30' in MCDR data base. Bottom inactive slope of the dump have been vegetated with native species to prevent erosion & surface run-off. Monitoring and management of rehabilitated areas of the dump have been continuing until the vegetation becomes self-sustaining.

vii) Catch drains and siltation ponds of appropriate size shall be constructed for the working pit, soil, OB and mineral dumps to arrest flow of silt and sediment directly into the Damsala Nallah and other water bodies. The water so collected should be utilized for watering the mine area, roads, green belt development etc. The drains should be regularly desilted particularly after the monsoon and maintained properly.

Garland drains, settling tanks and check dams of appropriate size, gradient and length shall be constructed both around the mine pit and overburden dump to prevent run off of water and flow of sediments directly into the Damsala Nallah and other water bodies and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years of data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material.

Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall/super cyclone period. A separate storm water sump for this purpose should be created.

➤ Catch drains/garland drains of appropriate size has been constructed around the working pit, OB & mineral dumps with siltation ponds at different intervals to arrest flow of silt & sediments. Whenever required, the silts & sediments have been cleaned. Mines pumped-out water is being used for dust suppression and plantation purposes.

- viii) Dimension of retaining wall at the toe of the overburden dump and the OB benches within the mine to check run-off and siltation should be based on the rainfall data.
- About 538 mtrs of retaining wall of width 1.5m and height 1.2m has been constructed at toe of the overburden dump to check run-off and siltation.
- ix) Effluents containing Cr^{+6} shall be treated to meet the prescribed standards before reuse/discharge. Effluent treatment plant should be provided for treatment of mine water discharge and wastewater generated from the workshop and mineral separation plant.
Run off from the OB dump and other surface run off should be analysed for Cr^{+6} and in case its concentration is found higher than the permissible limit the water should be treated before reuse/discharge.
- An Effluent Treatment Plant has been commissioned for treatment of mines discharge water. The concentration of Cr^{+6} in treated discharged water is <0.005 mg/l. The analysis report of mines final discharge water after treatment in ETP for the period from October, 2015 to March, 2016 is enclosed in **Annexure-1**.
- Small scale mining operation is being carried out with an Excavator & four nos. of dumpers only. Also the machineries & vehicles belong to the Contractor. The repairing of these vehicles are being done at outside workshop only. There is no workshop and mineral separation plant.
- Surface runoff water samples were collected in a settling pit during rainy season and then pumped to the ETP for treatment before final discharge.
- x) Separate impervious concrete pits for disposal of sludge shall be provided for the safe disposal of sludge generated from the mining operations.
- Sludge generated from mines contains Low Grade Chrome ore hence it has been stacked alongwith Low Grade Chrome ore for utilisation.
- xi) The project proponent shall ensure that the treated effluents conforming to the prescribed standards shall only be discharged.
- The mines pumped out water directly collected in the intake tank of ETP through pipeline and then treated by adding FeSO_4 & NaOH dosing. The final treated water is being discharged to outside ML area, which is conforming the prescribed standards. For analysis report refer **Annexure-1**.

- xii) Plantation shall be raised in an area of 12.715 ha. Including 7.5m wide green belt in the safety zone around the mining lease, overburden dump, roads etc. by planting the native species in consultation with the local DFO/Agriculture Dept. The density of the trees should be around 2500 plants per hect.
- During the period 2015-16 = 1730 Nos. and cumulative 4990 Nos. as per MCDR data of saplings have been planted in the Safety Zone area around the Mining lease and inactive bottom slope of the dump. Native species has been planted in consultation with local Forest Dept.
- xiii) The void left unfilled in an area of 5.21 ha. shall be converted into the water body. The higher benches of the excavated void/mine pit shall be terraced and plantation done to stabilize the slopes. The slopes of higher benches shall be made gentler for easy accessibility by the local people to use the water body. Peripheral fencing shall be carried out all along the excavated area.
- The same will be implemented at the end of mining operation.
- xiv) Effective safeguard measures, such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM & RSPM such as around crushing and screening plant, loading and unloading point and all transfer points. Extensive water sprinkling shall be carried out on haul roads. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.
- All the parameters of ambient air quality are well within the prescribed limit. Although, regular water sprinkling is being carried out on haul roads, loading & unloading points to control the dust generation at source. There is no crushing and screening plant.
- xv) Regular monitoring of water quality upstream and downstream of the Damsala nallah shall be carried out and record of monitored data should be maintained and submitted to the Ministry of Environment & Forests, its Regional Office, Bhubaneswar, the Central Ground water Authority, the Regional Director, Central Ground water Board, the State Pollution control Board and the Central Pollution Control Board.
- Monitoring of water quality upstream & downstream of the Damsala nallah is being carried out and record of monitoring data are being maintained. The monitoring results for the period from October, 2015 to March, 2016 is enclosed as **Annexure -2 & -3** and the same has been submitted to concerned authorities.

- xvi) The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.
- Garland drain water has been collected in pits and pond for recharge to ground water resources.
- xvii) Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and constructing new piezometers in and around the mining lease during the mining operation. The periodical monitoring {(at least four times in a year- pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January); once in each season)} shall be carried out in consultation with the state ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the MoEF and its Regional Office, Bhubaneswar, the Central Ground Water Authority and the Regional Director, CGWB. If at any stage, it is observed that the ground water table is getting depleted due to the mining activity, necessary corrective measures shall be carried out.
- Monitoring of ground water level & quality is being carried out in and around the mining lease and the analysis report is enclosed as **Annexure-4 to 9**. Tube well near TISCO main gate, Tube well inside the lease hold area and Tube well of village Ransol are in a network system.
- xviii) The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of water (surface water and ground water) for the project and effectively implement all the conditions stipulated therein.
- Permission has been obtained from Central Ground Water Authority, Ministry of Water Resources, New Delhi vide letter No.21-4(48)/SER/CGWA/2008-790 dt.17-06-2008.The stipulated conditions are being effectively implemented.
- xix) Suitable rainwater harvesting measures on long term basis shall be planned and implemented in consultation with the Regional Director, CGWB.
- Rain water has been collected in pits and pond for suitable rain water harvesting measures.
- xx) Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral. The mineral transportation shall be carried out through the covered trucks only and vehicles carrying the mineral shall not be overloaded.

- Vehicular emission of all machinery used in mining operations are being monitored regularly and kept under control by rigorous maintenance of all engines & changing of lubricants as per the recommendation of the manufacturer. The HEMMs, with valid PUC certificate are allowed for operation inside the mines. Transportation of mineral has been done through covered trucks and also avoid overloading.
- xxi) Blasting operation shall be carried out only during the day time. Controlled blasting shall be practiced. The mitigative measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented.
- At present, blasting operation has not been carried out. Excavation has been carried out by machine only.
- xxii) Drills shall either be operated with dust extractors or equipped with water injection system
- Drilling has not been done so far. In future, if drilling is required, then wet drilling practice will be adopted.
- xxiii) Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.
- Water spraying arrangement is being carried out on mineral handling area, loading & unloading areas to suppress dust generation.
- xxiv) Sewage treatment plant shall be installed for the colony, ETP shall also be provided for the workshop and waste water generated during the mining operation.
- As there is no colony inside lease area, so sewage treatment plant is not necessary. All the mining machineries have been engaged by contractor for mining operation and the maintenance work of their machines have been carried out at outside workshop. Therefore, question of workshop effluent does not arise. An ETP has been established for treatment of mines pumped out water and surface runoff water before discharge to outside leasehold area.
- xxv) Consent to operate shall be obtained from the State Pollution Control Board, Odisha before starting production from the mine.

- Consent to Operate has been obtained from SPCB, Odisha before starting production from the mine. Mining operation has been going on with valid consent to operate obtained from SPCB vide their letter No. 2485/IND-I-CON-6318, Dtd.06-02-2016 for the period upto 31.03.2020.
- xxvi) The project authorities should undertake sample survey to generate data on pre-project community health status within a radius of 1 km from proposed mine.
- Sample survey for community health status within 1 Km radius from Project area has already been done.
- xxvii) Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.
- Pre-placement medical examination has already been carried out of the workers engaged in the project and the records are being maintained and periodical medical examination is carried out once in five years.
- xxviii) Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.
- Housing for construction labour is not required, since the labourers are coming from nearby Villages.
- xxix) The critical parameters such as SPM, RSPM, NO_x, In the ambient air within the impact zone, peak particle velocity at 300m distance or within the nearest habitation, whichever is closure shall be monitored periodically (atleast once a month). Further, quality of discharged water shall also be monitored (TDS, DO, PH, suspended particulate matter and Cr⁺⁶). The monitored data shall be uploaded on the website as well as displayed on a display board at a suitable location in public domain.
- Parameters such as PM₁₀, PM_{2.5}, NO_x & SO₂ in the Ambient Air and Quality of discharge water are being monitored. The monitored data is being uploaded in the Company Website and display on a display board installed at the main gate of the mines. Blasting operation has not been carried out. Hence peak particle velocity has not been monitored.

xxx) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna namely elephant etc. spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Dept. All the safeguard measures brought out in the Wildlife Conservation Plan so prepared specific to this project site shall be effectively implemented. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. A copy of action plan shall be submitted to the MoEF and its Regional Office, Bhubaneswar.

- The endangered Flora and fauna are not spotted in the study area. Hence, action plan for conservation for the same is not required.

xxxi) A final Mine Closure Plan along with details of Corpus Fund shall be submitted to the MoEF 5 years in advance of final mine closure for approval.

- The same will be submitted in due time to MOEF for approval.

B) GENERAL CONDITIONS:

I. No change in mining technology and scope of working should be made without prior approval of the MoEF.

- The Mining technology & scope of working will not change without approval of Ministry of Environment & Forest.

II. No change in the calendar plan including excavation, quantum of mineral chromite ore and the waste shall be made.

- The calendar plans including excavation, quantum of mineral chromite ore and waste overburden have not been changed. The calendar plan including excavation, quantum of mineral chromite ore and overburden generated during the period October, 2015 to March, 2016 is given in **Annexure-10**.

III. Atleast four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for RSPM, SPM, SO₂, & NO_x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board.

- Ambient Air quality monitoring stations has already been established in consultation with SPCB.

- IV. Data on ambient air quality (RSPM, SPM, SO₂ & NO_x) should be regularly submitted to the MoEF including its Regl. Office located at Bhubaneswar and the state Pollution Control Board / Central Pollution Control Board once in six months.
- Data on Ambient Air Quality Monitoring with respect to PM₁₀, PM_{2.5}, SO₂ & NO_x are being carried out. The monitoring data for the period from October, 2015 to March, 2016 is enclosed as **Annexure 11 & 12**. The copy of same has been submitted to the ministry and SPCB, Bhubaneswar regularly.
- V. Fugitive dust emissions from all the sources should be controlled regularly. Water spraying arrangement on haul roads, loading and unloading and at transfer points should be provided and properly maintained.
- Control of fugitive dust emission is being carried out by water spraying on haul roads, loading & unloading points and ore handling yard regularly.
- VI. Measures should be taken for control of noise levels below 85 dB (A) in the work environment. Workers engaged in operations of HEMM etc. should be provided with ear plugs/muffs.
- Control measures such as maintenance of all machines including checking of silencers regularly, and changing of engine oil as per recommendation of the manufacturer has been carried out regularly. The workers engaged at noise generating areas are provided with ear plugs/muffs. The present noise level at work environment is below 85 dB (A). Sound pressure level at work environment is enclosed as **Annexure -13**.
- VII. Industrial waste water (Workshop & Waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422(E) Dtd. 19th May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.
- The Mines waste water is being collected directly in intake tank of the ETP for treatment of Cr⁺⁶ and finally discharged to outside ML area. The analysis of this water shows that all parameters are well within the prescribed limit. The analysis report of mines final discharge water after treatment in ETP is given in **Annexure -1**. Almost all mining machineries and transporting vehicles are being engaged on contract basis for transportation of OB and chrome ore. The repairing of these vehicles are being done at outside workshop by the contractor. Therefore, question of workshop effluent does not arise.

- VIII. Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.
Occupational health surveillance of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.
- In addition to water spraying to suppress dust generation, workers engaged in dusty areas such as dumper drivers, HEMM Operators, are being provided with nose masks as a precautionary measure.
- Training & information on safety, health hazards are being given to all categories of deserved workers.
- Occupational health surveillance programme of all categories of workers and employees have been conducted periodically.
- IX. A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organisation.
- A separate Environment Management Cell with qualified personnel and well equipped Environment Engineering Laboratory is functioning under the control of Senior Executive.
- X. The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the MoEF and its Regl. Office located at Bhubaneswar.
- Separate funds provision is made to carryout environmental protection measures. Details of expenses for Environmental protection measures during the year 2015-16 and proposed budgeted amount for the year 2016-17 are given in **Annexure-14**.
- XI. The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.
- The date of final approval of the Project is 04.10.2010 by DMS and 23-01-2012 by SPCB.
- XII. The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the Officer (s) of the Regional Office by furnishing the requisite data/information/ monitoring reports.

- The project authorities will extend full co-operation to the officers of the Regional office by furnishing the requisite data/ information/ monitoring reports.
- XIII. The project proponent shall submit six monthly report on the status of the implementation of the stipulated environmental safeguards to the MoEF, its Regl. Office, Bhubaneswar, CPCB, and SPCB, The project proponent shall upload the status of compliance of the environment clearance conditions on their website and update the same periodically and simultaneously send the same by e-mail to the Regional Office, MoEF, Bhubaneswar.
- Implementing the conditions stipulated in the Environmental Clearance letter. The report on Status of compliance of the Environmental Clearance conditions have been submitted to the concerned authorities and the same is being uploaded in our website.

ANNEXURE-1**EFFLUENT WATER ANALYSIS REPORT AS PER IS-2490 & MOEF GUIDELINE**
19.05.93

PROJECT : KALARANGIATTA CHROMITE MINE
 STATION : MINES FINAL DISCHARGE WATER AFTER TREATMENT IN ETP
 PERIOD : OCTOBER, 2015 TO MARCH, 2016
 SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

SL. NO.	CHARACTERISTICS	Limit as Per IS-2490 & MOEF Guideline	R E S U L T	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	Colour	-	Colorless	Colorless
02.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
03.	Suspended solids mg/l	100	18	37
04.	Particle size of suspended solids	Shall pass 850 micron IS sieve	100% passed	100% passed
05.	pH Value	5.0 – 9.0	7.5	8.1
06.	Total residual chlorine(Cl)mg/l	1.0	Absent	Absent
07.	Ammonical Nitrogen(N) mg/l	50	1.3	1.5
08.	Total Kjeldahl Nitrogen(N)mg/l	100	4.2	4.7
09.	BOD(O ₂)mg/l(3 days at 27°C)	30	1.3	1.3
10.	COD (O ₂) mg/l	250	4.9	5.6
11.	Total Chromium(Cr)mg/l	2.0	0.28	0.36
12.	Nitrate Nitrogen(N)mg/l	10	1.32	1.44
13.	Iron (Fe) mg/l	3.0	1.16	1.28
14.	Bio-Assay Test	90% survival of fish in 100% effluent after 96 hrs.	100% survived	100% survived
15.	Oil & grease mg/l	10	All are below detection limit	
16.	Free Ammonia(NH ₃)mg/l	5		
17.	Arsenic(As)mg/l	0.2		
18.	Mercury(Hg),mg/l	0.01		
19.	Lead(Pb)mg/l	0.1		
20.	Cadmium(Cd),mg/l	2.0		
21.	Hex. Chromium(Cr ⁺⁶)mg/l	0.1		
22.	Copper(Cu)mg/l	3.0		
23.	Zinc (Zn),mg/l	5.0		
24.	Selenium(Se)mg/l	0.05		
25.	Nickel mg/l	3.0		
26.	Cyanide (CN)mg/l	0.2		
27.	Fluorides(F) mg/l	2.0		
28.	Dissolved Phosphate(P)mg/l	5.0		
29.	Sulphide(S) mg/l	2.0		
30.	Phenolic compounds (C ₆ H ₅ OH),mg/l	1.0		
31.	Manganese(Mn),mg/l	2.0		
32.	Vanadium(V) mg/l	0.2		

SURFACE WATER ANALYSIS REPORT AS PER IS-2296(C)-1982

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : DAMSALA NALLAH UP-STREAM WATER (100 MTR. UP)
 PERIOD : OCTOBER, 2015 TO MARCH, 2016
 SURVEY CONDUCTED BY ENVIRONMENT ENGINEERING LABORATORY, FACOR

Sl. No.	CHARACTERISTICS	Limit as per IS-2296(C) 1982	R E S U L T S	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	P ^H Value	6.5 – 8.5	8.0	8.0
02.	Dissolved Oxygen(O ₂),mg/l	4.0	5.7	5.4
03.	BOD(O ₂)mg/l(3 days at 27°C)	3.0	1.9	2.2
04.	Total Coliform organisms (MPN/100ml)	5000	430	430
05.	Colour(Hazen Unit)	300	Colourless	Colourless
06.	Fluoride (F) mg/l	1.5	<0.01	<0.01
07.	Cadmium (Cd) mg/l	0.01	<0.005	<0.005
08.	Chlorides(Cl),mg/l	600	28	34
09.	Hex. Chromium(Cr ⁺⁶)mg/l	0.05	0.14	0.11
10.	Cyanides(CN),mg/l	0.05	<0.01	<0.01
11.	Total dissolved solids, mg/l	1500	175	190
12.	Selenium (Se) mg/l	0.05	<0.005	<0.005
13.	Sulphates (So ₄) mg/l	400	8.30	7.84
14.	Lead(Pb) mg/l	0.1	<0.01	<0.01
15.	Copper (Cu) mg/l	1.5	<0.01	<0.01
16.	Arsenic (As) mg/l	0.2	<0.001	<0.001
17.	Iron (Fe) mg/l	50	0.10	0.012
18.	Phenolic Compounds (C ₆ H ₅ OH), mg/l	0.005	<0.001	<0.001
19.	Zinc (Zn), mg/l	15	<0.01	<0.01
20.	Insecticides	Absent	Absent	Absent
21.	Anionic detergents(MBAS),mg/l	1.0	Absent	Absent
22.	Oil & grease, mg/l	0.1	<0.01	<0.01
23.	Nitrate (NO ₃), mg/l	50	4.72	4.61

ANNEXURE-3**SURFACE WATER ANALYSIS REPORT AS PER IS-2296(C)-1982**

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : DAMSALA NALLAH DOWN-STREAM WATER (100
 MTR. DOWN)
 PERIOD : OCTOBER, 2015 TO MARCH, 2016
 SURVEY CONDUCTED BY ENVIRONMENT ENGINEERING LABORATORY,
 FACOR

Sl. No.	CHARACTERISTICS	Limit as per IS-2296(C) 1982	R E S U L T S	
			IV Season Oct. -Dec.	I Season Jan. - Mar.
01.	P ^H Value	6.5 – 8.5	8.0	8.1
02.	Dissolved Oxygen(O ₂),mg/l	4.0	5.8	4.2
03.	BOD(O ₂)mg/l(3 days at 27°C)	3.0	1.9	2.2
04.	Total Coliform organisms (MPN/100ml)	5000	395	434
05.	Colour(Hazen Unit)	300	Colourless	Colourless
06.	Fluoride (F) mg/l	1.5	<0.01	<0.01
07.	Cadmium (Cd) mg/l	0.01	<0.005	<0.005
08.	Chlorides(Cl),mg/l	600	26	34
09.	Hex. Chromium(Cr ⁺⁶)mg/l	0.05	0.13	0.03
10.	Cyanides(CN),mg/l	0.05	<0.01	<0.01
11.	Total dissolved solids, mg/l	1500	172	186
12.	Selenium (Se) mg/l	0.05	<0.005	<0.005
13.	Sulphates (So ₄) mg/l	400	8.17	7.78
14.	Lead(Pb) mg/l	0.1	<0.01	<0.01
15.	Copper (Cu) mg/l	1.5	<0.01	<0.01
16.	Arsenic (As) mg/l	0.2	<0.001	<0.001
17.	Iron (Fe) mg/l	50	0.09	0.072
18.	Phenolic Compounds (C ₆ H ₅ OH), mg/l	0.005	<0.001	<0.001
19.	Zinc (Zn), mg/l	15	<0.01	<0.01
20.	Insecticides	Absent	Absent	Absent
21.	Anionic detergents(MBAS),mg/l	1.0	Absent	Absent
22.	Oil & grease, mg/l	0.1	<0.01	<0.01
23.	Nitrate (NO ₃), mg/l	50	4.65	4.54

MONITORING OF GROUND WATER LEVEL FROM SURFACE

PROJECT : KALARANGIATTA CHROMITE MINES

PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

Sl. No.	LOCATION	November, 2015 (in mtrs.)	January, 2016 (in mtrs)	Quality of water enclosed as Annexure
	<u>TUBE WELL :</u>			
01.	NEAR TISCO MAIN GATE	5.10	6.10	5
02.	INSIDE THE LEASE HOLD AREA	4.1	5.25	6
03.	VILLAGE : RANSOL	2.80	5.0	7
04.	VILLAGE – KALARANGIATTA	5.5	5.8	8
05.	VILLAGE : BHIMTANGAR	4.2	4.30	9

ANNEXURE -5**GROUND WATER ANALYSIS REPORT AS PER IS-10500**

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : TUBE WELL WATER NEAR TISCO MAIN GATE
 PERIOD : OCTOBER, 2015 TO MARCH, 2016
 SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING
 LABORATORY, FACOR

SL. NO	CHARACTERISTICS	Limit as Per IS-10500	RESULTS	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	Colour	10	Colourless	Colourless
02.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
03.	Taste	Agreeable	Agreeable	Agreeable
04.	Turbidity	10	Transparent	Transparent
05.	Dissolved solids, mg/l	500	120	133
06.	pH value	6.5 – 8.5	7.7	7.8
07.	Total hardness (CaCO ₃),mg/l	300	137	140
08.	Calcium (Ca),mg/l	75	21.20	24.40
09.	Magnesium(Mg),mg/l	30	20.16	19.36
10.	Iron (Fe),mg/l	0.3	0.022	0.024
11.	Chlorides(Cl),mg/l	250	22	26
12.	Sulphates(SO ₄),mg/l	150	3.14	3.42
13.	Nitrates(NO ₃),mg/l	45	4.02	4.25
14.	Anionic detergent (MBAS), mg/l	0.2	All are absent	
15.	Residual Chlorine(Cl),mg/l	0.2		
16.	Coliform organisms MPN/100ml	Absent		
17.	Copper (Cu), mg/l	0.05	All are below detection limit	
18.	Manganese(Mn),mg/l	0.1		
19.	Fluorides(F),mg/l	0.6 – 1.2		
20.	Phenolic Compounds (C ₆ H ₅ OH), mg/l	0.001		
21.	Mercury (Hg), mg/l	0.001		
22.	Cadmium (Cd), mg/l	0.01		
23.	Selenium(Se),mg/l	0.01		
24.	Arsenic (As),mg/l	0.05		
25.	Cyanide (CN), mg/l	0.05		
26.	Lead (Pb), mg/l	0.1		
27.	Hexavalent Chromium (Cr ⁺⁶), mg/l	0.05		
28.	Zinc (Zn), mg/l	5.0		
29.	Mineral oil, mg/l	0.01		

ANNEXURE -6**GROUND WATER ANALYSIS REPORT AS PER IS-10500**

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : TUBE WELL INSIDE THE LEASE HOLD AREA
 PERIOD : OCTOBER, 2015 TO MARCH, 2016
 SURVEY CONDUCTED BY ENVIRONMENTAL ENGINEERING
 LABORATORY, FACOR

SL. NO	CHARACTERISTICS	Limit as Per IS-10500	RESULTS	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	Colour	10	Colourless	Colourless
02.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
03.	Taste	Agreeable	Agreeable	Agreeable
04.	Turbidity	10	Transparent	Transparent
05.	Dissolved solids, mg/l	500	162	176
06.	pH value	6.5 – 8.5	7.7	7.8
07.	Total hardness (CaCO ₃),mg/l	300	136	152
08.	Calcium (Ca),mg/l	75	22.4	26.3
09.	Magnesium(Mg),mg/l	30	19.20	20.10
10.	Iron (Fe),mg/l	0.3	0.022	0.026
11.	Chlorides(Cl),mg/l	250	22	24
12.	Sulphates(SO ₄),mg/l	150	1.98	2.26
13.	Nitrates(NO ₃), mg/l	45	3.34	3.68
14.	Anionic detergent (MBAS) ,mg/l	0.2	} All are absent	
15.	Residual Chlorine(Cl),mg/l	0.2		
16.	Coliform organisms MPN/100ml	Absent		
17.	Copper (Cu) ,mg/l	0.05	} All are below detection limit	
18.	Manganese(Mn),mg/l	0.1		
19.	Fluorides(F),mg/l	0.6 – 1.2		
20.	Phenolic Compounds (C ₆ H ₅ OH) ,mg/l	0.001		
21.	Mercury (Hg), mg/l	0.001		
22.	Cadmium (Cd) ,mg/l	0.01		
23.	Selenium(Se),mg/l	0.01		
24.	Arsenic (As),mg/l	0.05		
25.	Cyanide (CN), mg/l	0.05		
26.	Lead (Pb) ,mg/l	0.1		
27.	Hexavalent Chromium (Cr ⁺⁶),mg/l	0.05		
28.	Zinc (Zn), mg/l	5.0		
29.	Mineral oil ,mg/l	0.01		

ANNEXURE -7**GROUND WATER ANALYSIS REPORT AS PER IS-10500**

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : TUBE WELL WATER OF VILL-RANSOL
 PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

SL. NO	CHARACTERISTICS	Limit as Per IS-10500	RESULTS	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	Colour	10	Colourless	Colourless
02.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
03.	Taste	Agreeable	Agreeable	Agreeable
04.	Turbidity	10	Transparent	Transparent
05.	Dissolved solids, mg/l	500	118	134
06.	pH value	6.5 – 8.5	7.7	7.7
07.	Total hardness (CaCO ₃),mg/l	300	140	152
08.	Calcium (Ca),mg/l	75	24.20	25.20
09.	Magnesium(Mg),mg/l	30	19.08	21.00
10.	Iron (Fe),mg/l	0.3	0.022	0.024
11.	Chlorides(Cl),mg/l	250	22	28
12.	Sulphates(SO ₄),mg/l	150	3.12	3.46
13.	Nitrates(NO ₃) ,mg/l	45	3.86	4.10
14.	Anionic detergent (MBAS) ,mg/l	0.2	All are absent	
15.	Residual Chlorine(Cl),mg/l	0.2		
16.	Coliform organisms MPN/100ml	Absent		
17.	Copper (Cu), mg/l	0.05	All are below detection limit	
18.	Manganese(Mn),mg/l	0.1		
19.	Fluorides(F),mg/l	0.6 – 1.2		
20.	Phenolic Compounds (C ₆ H ₅ OH) ,mg/l	0.001		
21.	Mercury (Hg) ,mg/l	0.001		
22.	Cadmium (Cd), mg/l	0.01		
23.	Selenium(Se),mg/l	0.01		
24.	Arsenic (As),mg/l	0.05		
25.	Cyanide (CN), mg/l	0.05		
26.	Lead (Pb) ,mg/l	0.1		
27.	Hexavalent Chromium(Cr ⁺⁶), mg/l	0.05		
28.	Zinc (Zn) ,mg/l	5.0		
29.	Mineral oil ,mg/l	0.01		

ANNEXURE -8**GROUND WATER ANALYSIS REPORT AS PER IS-10500**

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : TUBE WELL WATER OF VILL-KALARANGIATTA
 PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

SL. NO	CHARACTERISTICS	Limit as Per IS-10500	RESULTS	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	Colour	10	Colourless	Colourless
02.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
03.	Taste	Agreeable	Agreeable	Agreeable
04.	Turbidity	10	Transparent	Transparent
05.	Dissolved solids, mg/l	500	128	134
06.	pH value	6.5 – 8.5	7.7	7.7
07.	Total hardness (CaCO ₃),mg/l	300	145	160
08.	Calcium (Ca),mg/l	75	24.80	27.20
09.	Magnesium(Mg),mg/l	30	19.92	22.00
10.	Iron (Fe),mg/l	0.3	0.022	0.024
11.	Chlorides(Cl),mg/l	250	24	28
12.	Sulphates(SO ₄),mg/l	150	2.78	2.94
13.	Nitrates(NO ₃),mg/l	45	3.04	3.28
14.	Anionic detergent (MBAS),mg/l	0.2	} All are absent	
15.	Residual Chlorine(Cl),mg/l	0.2		
16.	Coliform organisms MPN/100ml	Absent		
17.	Copper (Cu),mg/l	0.05	} All are below detection limit	
18.	Manganese(Mn),mg/l	0.1		
19.	Fluorides(F),mg/l	0.6 – 1.2		
20.	Phenolic Compounds (C ₆ H ₅ OH),mg/l	0.001		
21.	Mercury (Hg),mg/l	0.001		
22.	Cadmium (Cd),mg/l	0.01		
23.	Selenium(Se),mg/l	0.01		
24.	Arsenic (As),mg/l	0.05		
25.	Cyanide (CN),mg/l	0.05		
26.	Lead (Pb),mg/l	0.1		
27.	Hexavalent Chromium (Cr ⁺⁶),mg/l	0.05		
28.	Zinc (Zn),mg/l	5.0		
29.	Mineral oil ,mg/l	0.01		

ANNEXURE -9**GROUND WATER ANALYSIS REPORT AS PER IS-10500**

PROJECT : KALARANGIATTA CHROMITE MINES
 LOCATION : TUBE WELL WATER OF VILL-BHIMTANGAR
 PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

SL. NO	CHARACTERISTICS	Limit as Per IS-10500	RESULTS	
			IV Season Oct. –Dec.	I Season Jan. - Mar.
01.	Colour	10	Colourless	Colourless
02.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
03.	Taste	Agreeable	Agreeable	Agreeable
04.	Turbidity	10	Transparent	Transparent
05.	Dissolved solids, mg/l	500	146	168
06.	pH value	6.5 – 8.5	7.7	7.7
07.	Total hardness (CaCO ₃),mg/l	300	129	145
08.	Calcium (Ca),mg/l	75	20.00	24.80
09.	Magnesium(Mg),mg/l	30	18.96	19.20
10.	Iron (Fe),mg/l	0.3	0.022	0.022
11.	Chlorides(Cl),mg/l	250	18	20
12.	Sulphates(SO ₄),mg/l	150	1.64	1.70
13.	Nitrates(NO ₃), mg/l	45	3.26	3.56
14.	Anionic detergent (MBAS) ,mg/l	0.2	} All are absent	
15.	Residual Chlorine(Cl),mg/l	0.2		
16.	Coliform organisms MPN/100ml	Absent		
17.	Copper (Cu) ,mg/l	0.05	} All are below detection limit	
18.	Manganese(Mn),mg/l	0.1		
19.	Fluorides(F),mg/l	0.6 – 1.2		
20.	Phenolic Compounds (C ₆ H ₅ OH) ,mg/l	0.001		
21.	Mercury (Hg), mg/l	0.001		
22.	Cadmium (Cd) ,mg/l	0.01		
23.	Selenium(Se),mg/l	0.01		
24.	Arsenic (As),mg/l	0.05		
25.	Cyanide (CN), mg/l	0.05		
26.	Lead (Pb) ,mg/l	0.1		
27.	Hexavalent Chromium (Cr ⁺⁶),mg/l	0.05		
28.	Zinc (Zn), mg/l	5.0		
29.	Mineral oil ,mg/l	0.01		

ANNEXURE – 10

**CALENDAR PLAN INCLUDING EXCAVATION, QUANTUM OF MINERAL CHROMITE
AND WASTE
GENERATED DURING THE PERIOD FROM OCTOBER, 2015 TO
MARCH, 2016
IN OUR KALARANGIATTA CHROMITE MINES**

SL. NO.	MATERIALS	CALENDER PLAN PER ANNUM	QUANTITY GENERATED DURING THE PERIOD FROM OCTOBER, 2015 TO MARCH, 2016
01.	CHROME ORE	50,000 TONNES	16,325 TONNES
02.	WASTE OVER BURDEN	1,47,504 M ³	58,554 M ³

ANNEXURE-11**AIR QUALITY (CORE ZONE)**

PROJECT : KALARANGIATTA CHROMITE MINES
 PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

UNIT- $\mu\text{g}/\text{M}^3$

Sl. No.	STATION	PARAMETERS	IV Season Oct. –Dec.	I Season Jan. - Mar.	NAAQ STD
1.	Middle of the Quarry	PM ₁₀	55.12	56.73	100
		PM _{2.5}	22.16	20.06	60
		SO ₂	3.12	2.58	80
		NO _x	10.58	8.95	80
		CO	<1000	<1000	2000
2.	In front of the Office Building	PM ₁₀	46.38	48.52	100
		PM _{2.5}	19.02	18.68	60
		SO ₂	2.55	2.36	80
		NO _x	9.68	8.78	80
		CO	<1000	<1000	2000
3.	Southside of the ML Area	PM ₁₀	54.32	58.14	100
		PM _{2.5}	20.56	20.10	60
		SO ₂	2.53	2.73	80
		NO _x	9.67	9.87	80
		CO	<1000	<1000	2000
4.	West side of the ML Area	PM ₁₀	47.32	45.46	100
		PM _{2.5}	19.15	16.12	60
		SO ₂	2.46	2.48	80
		NO _x	9.08	8.76	80
		CO	<1000	<1000	2000

FREQUENCY: For Industrial area/work environment twice in a week 8 hourly continuous for a month of a Season.

ANNEXURE – 12**AIR QUALITY (BUFFER ZONE)**

PROJECT : KALARANGIATTA CHROMITE MINES
M/s. FACOR LTD.
PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING LABORATORY, FACOR

UNIT: $\mu\text{g}/\text{M}^3$

Sl. No.	STATIONS	PARAMETERS	R E S U L T S		NAAQ STD.
			IV Season Oct. –Dec.	I Season Jan. - Mar.	
01	KALIAPANI TOWNSHIP	PM ₁₀	50.18	46.36	100
		PM _{2.5}	16.85	19.52	60
		SO ₂	5.59	5.7	80
		NO _x	10.22	9.24	80
		CO	<1000	<1000	2000
02	VILL-GODISAH	PM ₁₀	30.67	36.16	100
		PM _{2.5}	14.54	17.02	60
		SO ₂	1.65	1.85	80
		NO _x	3.75	3.94	80
		CO	<1000	<1000	2000
03	VILL-BARAGAJI	PM ₁₀	27.79	30.24	100
		PM _{2.5}	12.69	14.84	60
		SO ₂	1.45	1.58	80
		NO _x	3.16	3.79	80
		CO	<1000	<1000	2000
04	VILL-RANSOL	PM ₁₀	29.08	35.36	100
		PM _{2.5}	13.42	15.54	60
		SO ₂	1.51	2.15	80
		NO _x	3.36	3.95	80
		CO	<1000	<1000	2000
05	VILL- BHIMTANGAR	PM ₁₀	42.35	48.38	100
		PM _{2.5}	18.93	20.15	60
		SO ₂	2.46	2.48	80
		NO _x	8.66	9.10	80
		CO	<1000	<1000	2000

FREQUENCY: For residential area twice in a week 24 hourly continuous for a month of a season.

SOUND PRESSURE LEVEL MEASUREMENT
(WORK ENVIRONMENT)

PROJECT : KALARANGIATTA CHROMITE MINES
PERIOD : OCTOBER, 2015 TO MARCH, 2016

SURVEY CONDUCTED BY: ENVIRONMENTAL ENGINEERING
LABORATORY, FACOR

UNIT: dB(A)

Sl.No.	Area / Location	Position	Measured Noise Level		
			IV Season Oct. -Dec.	I Season Jan. - Mar.	Limit in dB(A)
1.	Opencast quarry	Middle of the Quarry	64.1	64.8	85
2.	Office	Near Office	55.3	56.5	85

DETAILS OF EXPENSES FOR ENVIRONMENTAL PROTECTION MEASURES DURING THE YEAR 2015-16 AND PROPOSED BUDGETED AMOUNT FOR THE YEAR 2016-17**PROJECT : KALARANGIATTA CHROMITE MINES**

Sl. No.	I T E M	Expenses during the Year 2015-16 (in Rs.)	Proposed budgeted amount for the year 2016-17 (in Rs.)
01	AFFORESTATION		
a	Seedlings @ Rs.40/- each	69200	1,00,000
b	Fertilizer/Insecticide/Cow-dung	17300	25,000
c	Digging of Pits/Planting	17300	30,000
d	Post Plantation care (Watering, Watching & Weeding etc.)	69200	1,00,000
	Sub-Total	1,73,000	1,50,000
02	WATER TREATMENT		
a	ETP Operation & Maintenance (including costs of chemical & Manpower)	8,40,000	9,50,000
b	Water sample analysis	1,50,000	2,16,000
c	Drains cleaning and management	30,000	50,000
	Sub-Total	11,20,000	12,16,000
03	DUST SUPPRESSION, AIR MONITORING AND NOISE LEVEL MEASUREMENT		
a	Water spraying at dust generating points by water tanker around 210 days in a year @ Rs.350/- per trip costing 7 trips per day (7 x 350 x 210)	5,29,200	5,50,000
b	Air monitoring charges @ Rs.1600/- per sample for 288 samples in a year.	4,60,800	3,60,000
c	Noise level measurement	28,000	10,000
	Sub-Total	10,18,000	9,20,000
	Grand Total	22,11,000	22,86,000